

Remarks

Claims 2, 3, and 6-14 are now pending in this application. Applicants have amended claims 2, 3, and 6-12, presented new claims 13 and 14 and cancelled claims 1, 4, and 5 to clarify the present invention. Applicants respectfully request favorable reconsideration of this application.

With respect to the U.S. patent applications referred to in the specification, since the drafting of the present application, the assignee of the application and control of the prosecution has changed. No one currently connected with the prosecution of the application is aware of the correct application number or whether the documents referred to are actually U.S. patent applications. The Examiner also appears to be unable to identify the applications to which the specification refers. Therefore, Applicants propose to amend the specification to delete the incorrect patent application numbers, but leave the description of the solution described. In view of the above, Applicants respectfully request withdrawal of the objection to the disclosure.

The Examiner rejected claims 1-7 and 11 under 35 U.S.C. § 112, second paragraph, as indefinite. Applicants have corrected the spelling of "radially". Also, Applicants have clarified that the absorber material is neutron absorber material. This is supported by the specification at page 2, lines 2-14, and page 5, lines 24-36, among other passages.

With respect to the recitation of "upper part", "lower part", "inner part", and "outer part" of the control rod and/or the blades making up the control rod, such terms are not indefinite. The

meaning is clear from the specification and drawings to permit one of ordinary skill in the art to understand and practice the invention. This is supported by the court's decision in *Nordber, Inc. v. Telesmith, Inc.*, 36 U.S.P.Q.2d 1577 (DC EWis), in claims reciting "upper frame" and "lower frame" among other terms were found to be definite.

In view of the above, all pending claims comply with 35 U.S.C. § 112, second paragraph and Applicants respectfully request withdrawal of this rejection.

The present invention provides a unique control rod structure that addresses problems arising in the operation of a boiling water reactor. In particular, there is a risk of fuel failure in fuel rods located nearest the cruciform center of a control rod. This risk can arise from these fuel rods being protected against burnup of fissile material by two absorber blades. This is described in detail in the background of the invention of the application.

The present invention reduces the risk of fuel failure by providing a control rod that includes recesses lacking neutron absorbing material arranged at the cruciform center of the control rod. The present invention also provides a particular arrangement of recesses, as well as a particular arrangement of neutron absorbing material. By providing the recesses, the fissile material is more efficiently burned up.

In a boiling water reactor, water acts as the moderator to slow down the neutrons. Thereby, the water contributes to the burnup of fissile material. The recesses of the control rod of the present invention permit more of the water moderator to be located near the cruciform

center of the control rod. As a result, the moderation and, as a result, burnup of fissile material will be improved in fuel rods arranged in the vicinity of the recesses.

By providing larger recesses in the upper part of the control rod more moderator will be located adjacent fuel rods in the cruciform center of the upper part. Locating more moderator near fuel rods in the upper part of the control rod will particularly improve burnup of fissile material in the upper part. Therefore, when the control rod is extracted a certain distance, the fuel pellets located in the upper part of the fuel rods near the cruciform center will to a considerable extent have gone through a burnup of the fissile material. Therefore, a local increase in power does not take place as rapidly as in the prior art when the control rod is removed. As a result, risk of fuel failure is considerably reduced according to the present invention. This is a very significant achievement and advantage of the present invention.

The Examiner rejected claims 1-7 and 11 under 35 U.S.C. § 102(b) as being anticipated by U.S. patent 5,034,185 to Ueda et al. The Examiner rejected claims 1-7 under 35 U.S.C. § 103(a) as unpatentable over JO 1148-998-A to Ueda et al. in view of U.S. patent 5,034,185 to Ueda et al.

Ueda et al. does not disclose the present invention since, among other things, Ueda et al. does not disclose a control rod that includes recesses arranged at the cruciform center of the control rod wherein the recesses in an upper part of the control rod are wider than at least a majority of the recesses in the lower part of the control rod.

The Examiner identifies Fig. 36A of Ueda et al. as disclosing an outer part of a blade of a control rod that includes absorber material and an inner part that lacks absorber material.

However, contrary to the Examiner's assertion, Fig. 36A does not illustrate such recesses. As described at col. 37, lines 12-29, of Ueda et al., Fig. 36A discloses that a wing 615 of a control blade 610 may be formed of a long-lived neutron absorber 621. Ueda et al. describes a cut in an inner portion of the wing since the contribution of this portion to the reactivity is small, thereby reducing the total weight of the control blade. This cut out functions to reduce weight. Ueda et al. does not disclose controlling burnup of fissile material, only reducing weight.

Ueda et al. also discloses an engagement recess 633 to support the neutron absorber on a laterally-projecting support. Not only is this recess not to control burnup of fissile material, but it is arranged totally differently than the recesses of the control rod according to the present invention. Ueda et al. does not disclose any structure corresponding to the recesses of the present invention to provide the function of the recesses of the present invention. Nor does Ueda et al. disclose that the structure disclosed therein could provide such function.

Nishimura et al. does not disclose the present invention since, among other things, Nishimura et al. does not disclose a control rod that includes recesses arranged at the cruciform center of the control rod wherein the recesses in an upper part of the control rod are wider than at least a majority of the recesses in the lower part of the control rod. Rather, Nishimura et al. discloses a control rod that includes a decreasing amount of absorber material toward the upper end of the control rod. Nishimura et al. does not disclose a control rod that includes an inner part of an upper portion that lacks neutron absorber material while the outer part is provided with

lacking neutron absorber material.

Furthermore, Nishimura et al. does not disclose a control rod that includes first and second recesses as in the present invention. Nishimura et al. discloses a control rod that is supposed to have a prolonged service life, not a control rod to control burnup of fissile material, which is among the problems addressed by the present invention. Nishimura et al. does not include any disclosure of the problems addressed by the present invention.

In view of the above, neither Ueda et al. nor Nishimura et al. discloses all elements of the present invention as recited in claims 2, 3, and 6-14. Since neither Ueda et al. nor Nishimura et al. discloses all elements of the present invention as recited in claims 2, 3, and 6-14, the present invention, as recited in claims 2, 3, and 6-14, is not properly rejected under 35 U.S.C. § 102(b). For an anticipation rejection under 35 U.S.C. § 102(b) no difference may exist between the claimed invention and the reference disclosure. *See Scripps Clinic and Research Foundation v. Genentech, Inc.*, 18 U.S.P.Q. 841 (C.A.F.C. 1984).

Along these lines, anticipation requires the disclosure, in a cited reference, of each and every recitation, as set forth in the claims. *See Hodosh v. Block Drug Co.*, 229 U.S.P.Q. 182 (Fed. Cir. 1986); *Titanium Metals Corp. v. Banner*, 227 U.S.P.Q. 773 (Fed. Cir. 1985); *Orthokinetics, Inc. v. Safety Travel Chairs, Inc.*, 1 U.S.P.Q.2d 1081 (Fed. Cir. 1986); and *Akzo N.V. v. U.S. International Trade Commissioner*, 1 U.S.P.Q.2d 1081 (Fed. Cir. 1986).

JO 1148998-A does not suggest the present invention since, among other things, JO

1148998-A does not suggest a control rod that includes recesses arranged at the cruciform center of the control rod wherein the recesses in an upper part of the control rod are wider than at least a majority of the recesses in the lower part of the control rod. Rather, JO 1148998-A suggests a control rod having a long service life and providing a large reactor shut down tolerance. The structure JO 1148998-A suggests for achieving these purposes includes a hafnium long life neutron absorbing material arranged at the tip and tall sides of the control rod blade. The amount of neutron absorbing material may gradually decrease toward the insertion tall side. Such a control rod is not remotely similar to the control rod according to the present invention.

Combining the structure suggested by JO 1148998-A with the structure suggested by Ueda et al. does not suggest the present invention since the combination of references will still suffer from the same shortcomings as each individual structure as discussed above. The combination JO 1148998-A and Ueda et al. will still not suggest a control rod that includes recesses arranged at the cruciform center of the control rod wherein the recesses in an upper part of the control rod are wider than at least a majority of the recesses in the lower part of the control rod. The combination JO 1148998-A and Ueda et al. does not suggest that an inner part of the upper part of the control rod should lack neutron absorbing material. Furthermore, the combination JO 1148998-A and Ueda et al. does not suggest the problems addressed by the structure of the present invention, such as the risk of fuel failure in certain fuel rods. One of ordinary skill in the art would not look for a solution to a problem in references that do not even suggest the problem, much less a solution to the problem.

In view of the above, the references relied upon in the office action, whether considered

alone or in combination, do not disclose or suggest patentable features of the present invention.

Therefore, the references relied upon in the office action, whether considered alone or in combination, do not anticipate or make the present invention obvious. Accordingly, Applicants respectfully request withdrawal of the rejections based upon the cited references.

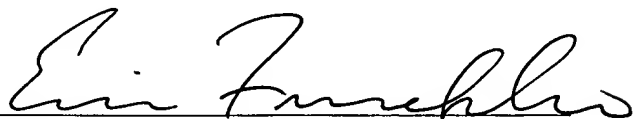
In conclusion, Applicants respectfully request favorable reconsideration of this case and early issuance of the Notice of Allowance.

If an interview would facilitate the prosecution of this case, Applicants urge the Examiner to contact the undersigned at the telephone number listed below.

The undersigned authorizes the Commissioner to charge insufficient fees or credit overpayment associated with this communication to Deposit Account No. 19-5127, 19378.0012.

Respectfully submitted,

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